



# Risk Analysis

Wyoming State Treasurer's Office



**Total Return Focused  
Target Allocation Risk Summary  
May 1, 2008 to June 30, 2019**

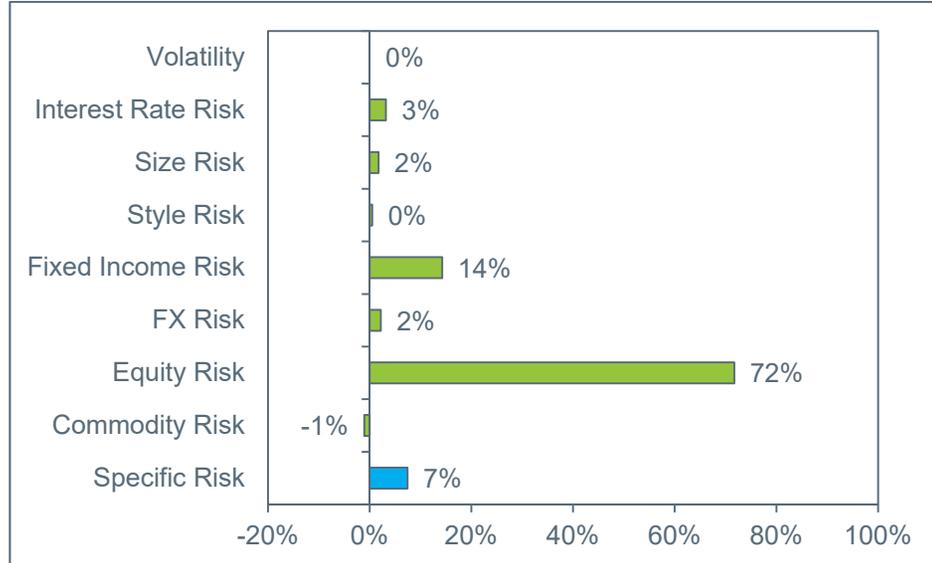
**Total Portfolio Summary**

Volatility	6.2%
Value at Risk (VaR)*	12.9%
Expected Tail Loss (ETL)*	16.6%
Expected Tail Return (ETR)*	13.0%
Rachev Ratio (ETR/ETL)*	0.8
STARR Performance (Excess Return/ETL)**	0.1

\*Calculated with a 99% Confidence Interval.

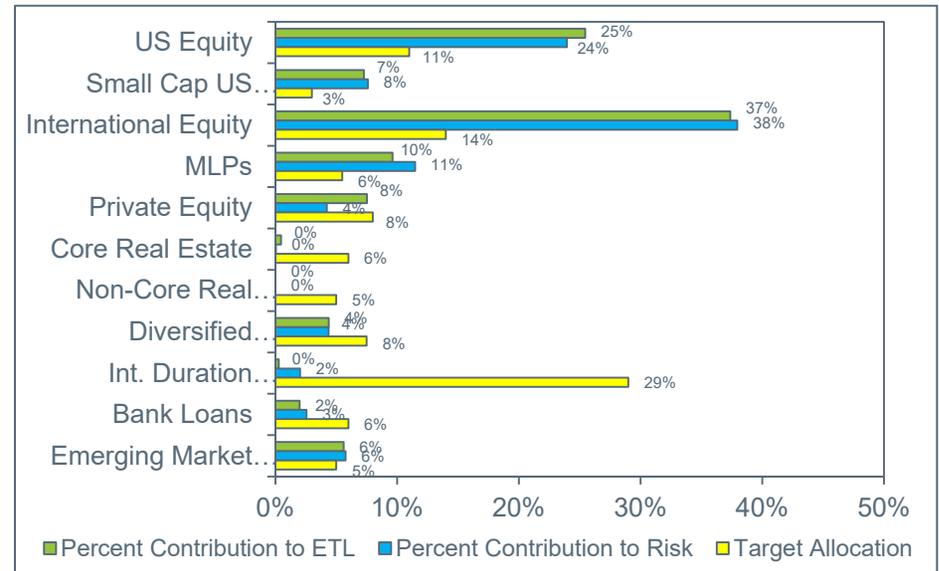
\*\*Similar to the Sharpe Ratio which is a standard deviation-based performance measure, but STARR (stable tail-adjusted return ratio) uses the ETL in the denominator as a risk measure. STARR can be seen as a more effective indicator of risk-adjusted performance because it penalizes only for downside risk, while the standard deviation does not distinguish between upside and downside risk.

**Factor Contribution to Risk**

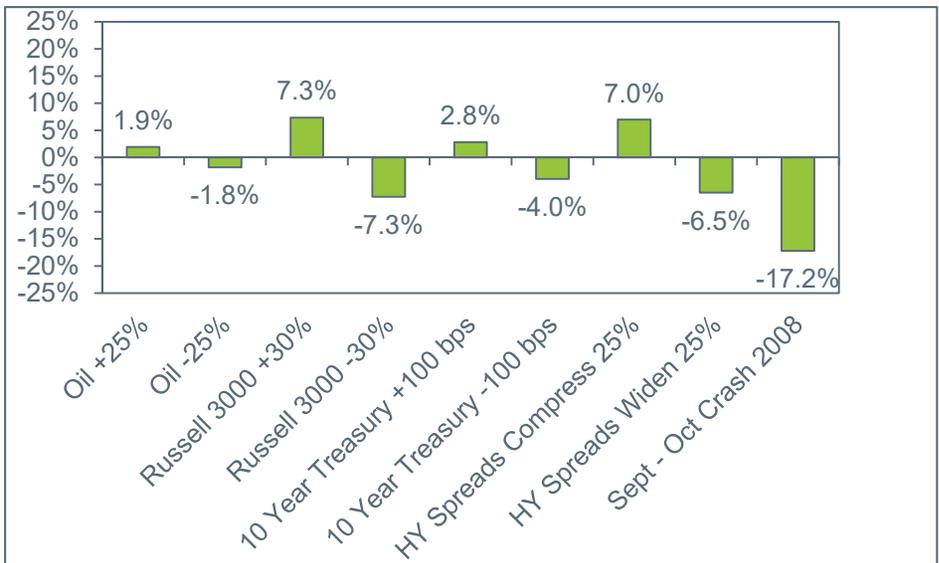


Analysis provided by PerTrac RiskPlus powered by FinAnalytica. All values are annual.

**Percent Contribution to Risk and ETL**



**Portfolio Historical Stress Tests**



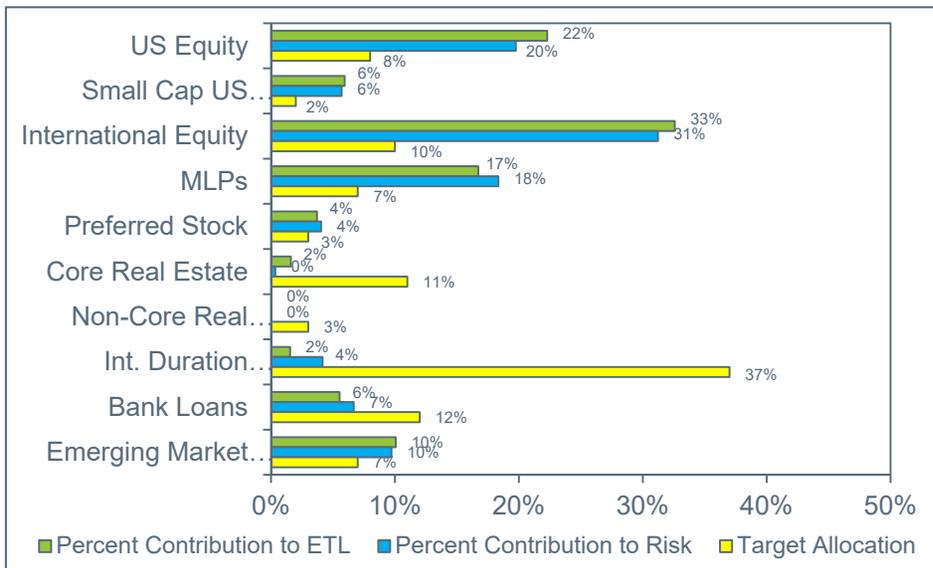
**Income Focused  
Target Allocation Risk Summary  
May 1, 2008 to June 30, 2019**

**Total Portfolio Summary**

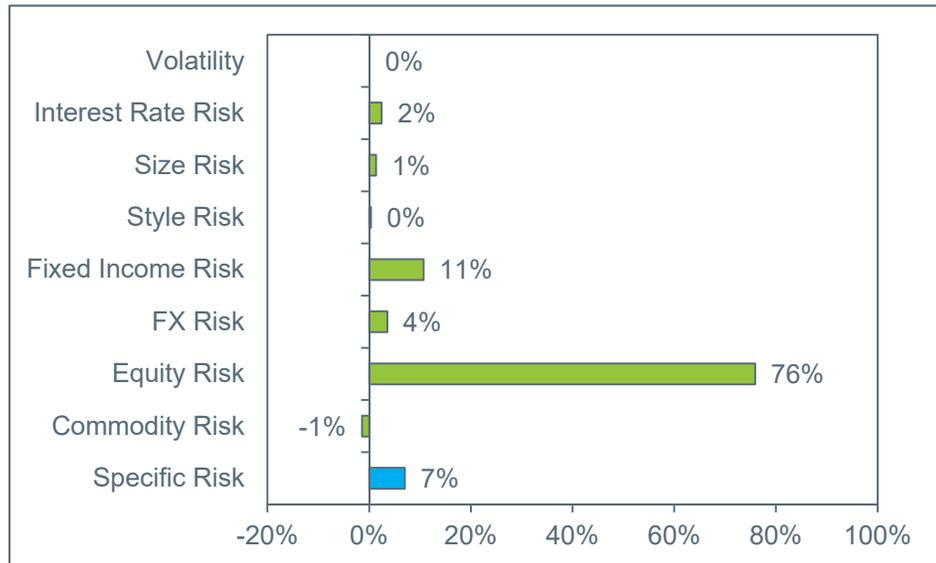
Volatility	5.3%
Value at Risk (VaR)*	9.8%
Expected Tail Loss (ETL)*	12.6%
Expected Tail Return (ETR)*	11.3%
Rachev Ratio (ETR/ETL)*	0.9
STARR Performance (Excess Return/ETL)**	0.1

\*Calculated with a 99% Confidence Interval.  
 \*\*Similar to the Sharpe Ratio which is a standard deviation-based performance measure, but STARR (stable tail-adjusted return ratio) uses the ETL in the denominator as a risk measure. STARR can be seen as a more effective indicator of risk-adjusted performance because it penalizes only for downside risk, while the standard deviation does not distinguish between upside and downside risk.

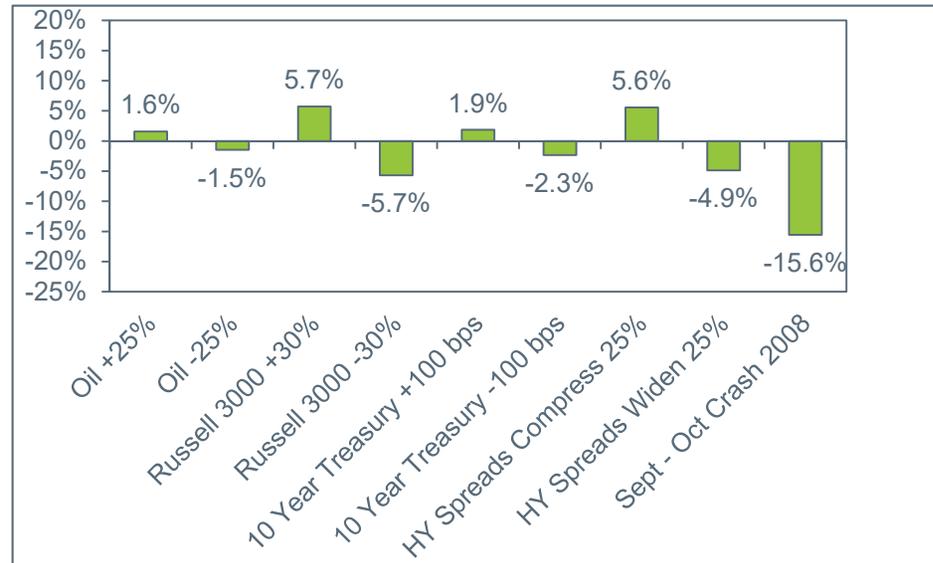
**Percent Contribution to Risk and ETL**



**Factor Contribution to Risk**



**Portfolio Historical Stress Tests**



Analysis provided by PerTrac RiskPlus powered by FinAnalytica. All values are annual.

**Workers Compensation Fund  
Target Allocation Risk Summary  
May 1, 2008 to June 30, 2019**

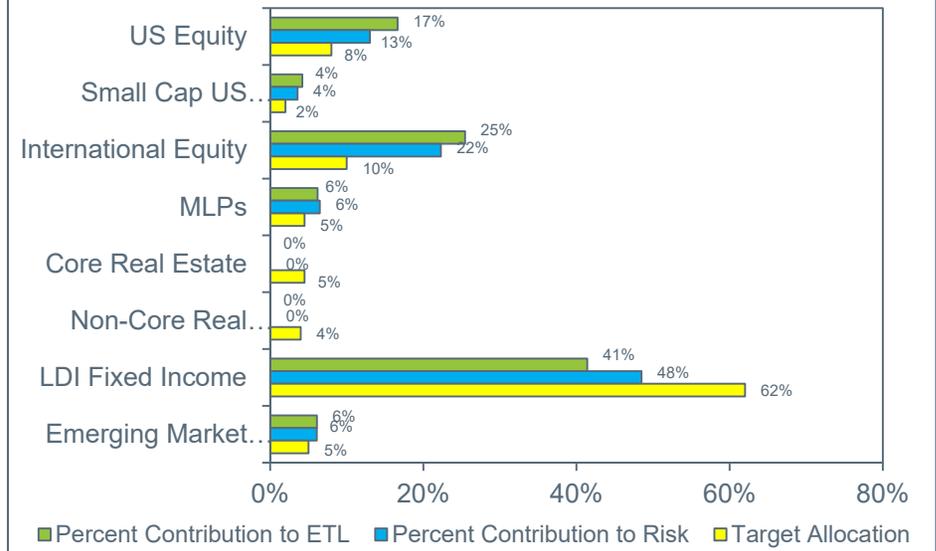
**Total Portfolio Summary**

Volatility	5.7%
Value at Risk (VaR)*	9.4%
Expected Tail Loss (ETL)*	12.9%
Expected Tail Return (ETR)*	13.6%
Rachev Ratio (ETR/ETL)*	1.1
STARR Performance (Excess Return/ETL)**	0.1

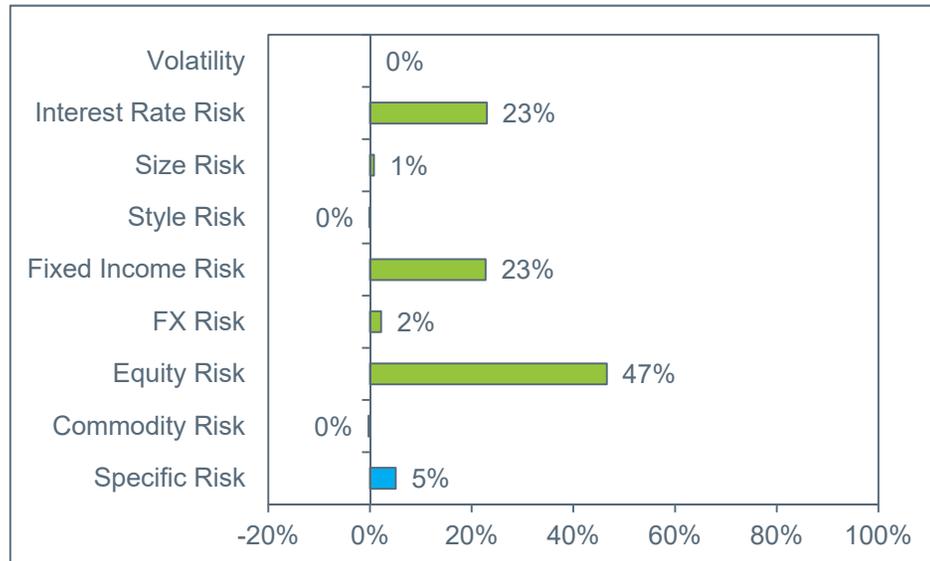
\*Calculated with a 99% Confidence Interval.

\*\*Similar to the Sharpe Ratio which is a standard deviation-based performance measure, but STARR (stable tail-adjusted return ratio) uses the ETL in the denominator as a risk measure. STARR can be seen as a more effective indicator of risk-adjusted performance because it penalizes only for downside risk, while the standard deviation does not distinguish between upside and downside risk.

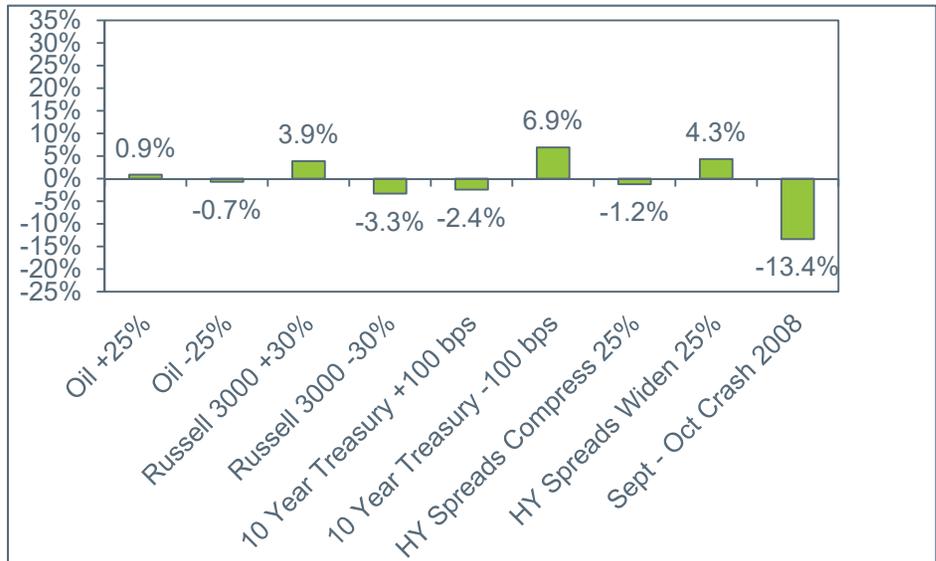
**Percent Contribution to Risk and ETL**



**Factor Contribution to Risk**



**Portfolio Historical Stress Tests**



Analysis provided by PerTrac RiskPlus powered by FinAnalytica. All values are annual.

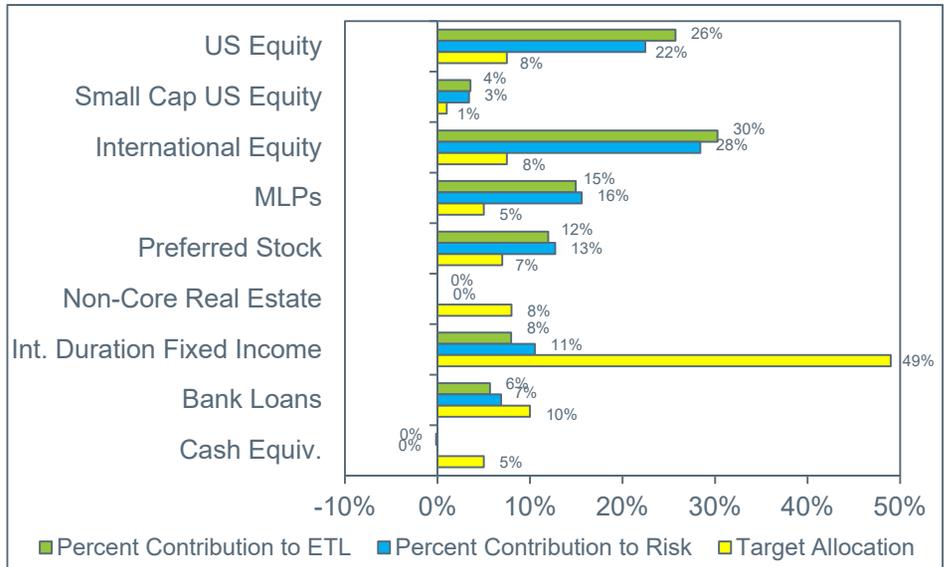
**Pool A**  
**Target Allocation Risk Summary**  
 May 1, 2008 to June 30, 2019

**Total Portfolio Summary**

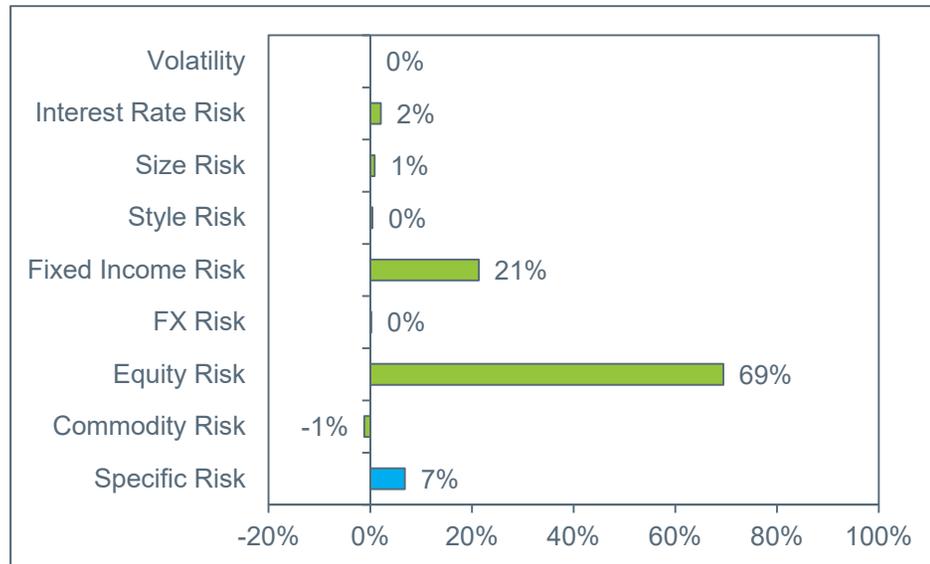
Volatility	4.2%
Value at Risk (VaR)*	6.6%
Expected Tail Loss (ETL)*	8.9%
Expected Tail Return (ETR)*	8.6%
Rachev Ratio (ETR/ETL)*	1.0
STARR Performance (Excess Return/ETL)**	0.1

\*Calculated with a 99% Confidence Interval.  
 \*\*Similar to the Sharpe Ratio which is a standard deviation-based performance measure, but STARR (stable tail-adjusted return ratio) uses the ETL in the denominator as a risk measure. STARR can be seen as a more effective indicator of risk-adjusted performance because it penalizes only for downside risk, while the standard deviation does not distinguish between upside and downside risk.

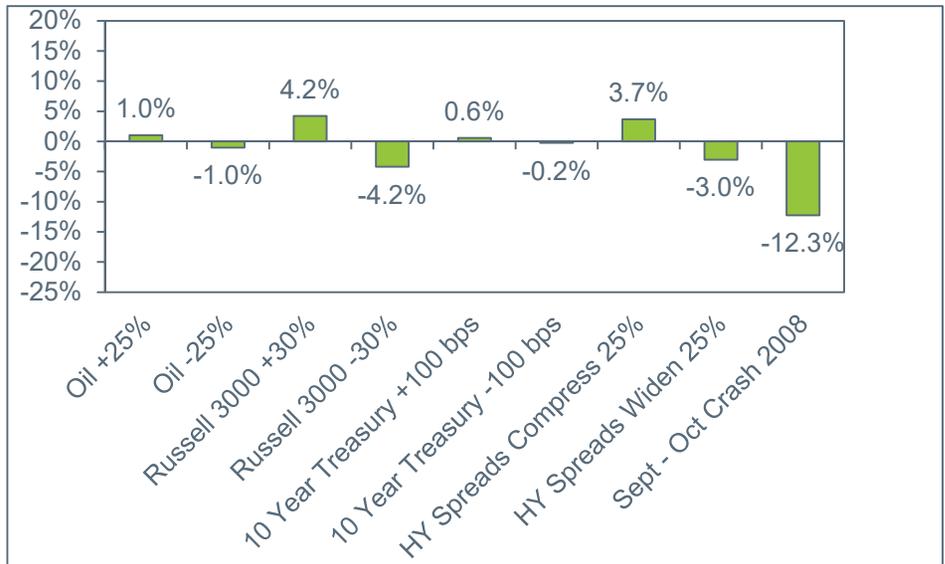
**Percent Contribution to Risk and ETL**



**Factor Contribution to Risk**



**Portfolio Historical Stress Tests**



Analysis provided by PerTrac RiskPlus powered by FinAnalytica. All values are annual.

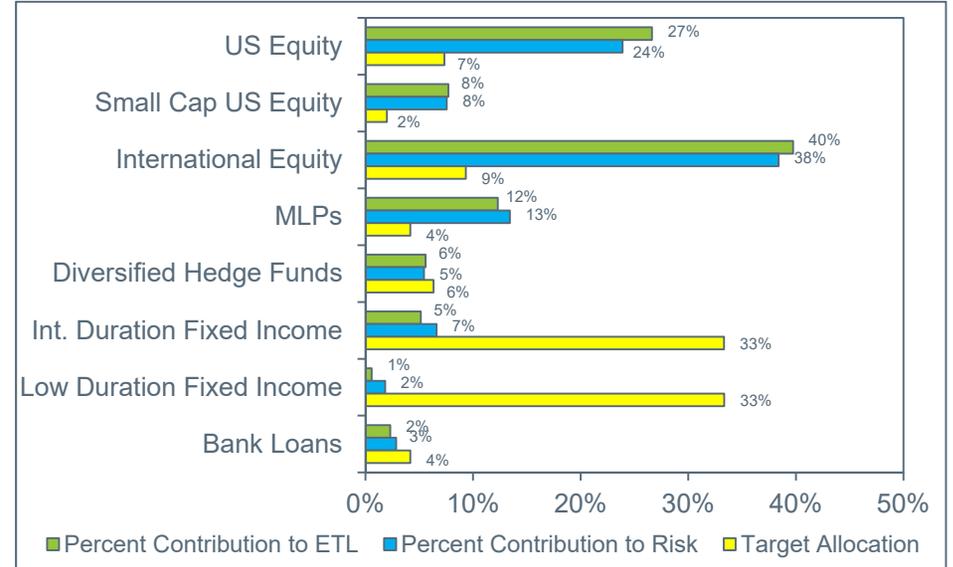
**LSRA**  
**Target Allocation Risk Summary**  
 May 1, 2008 to June 30, 2019

**Total Portfolio Summary**

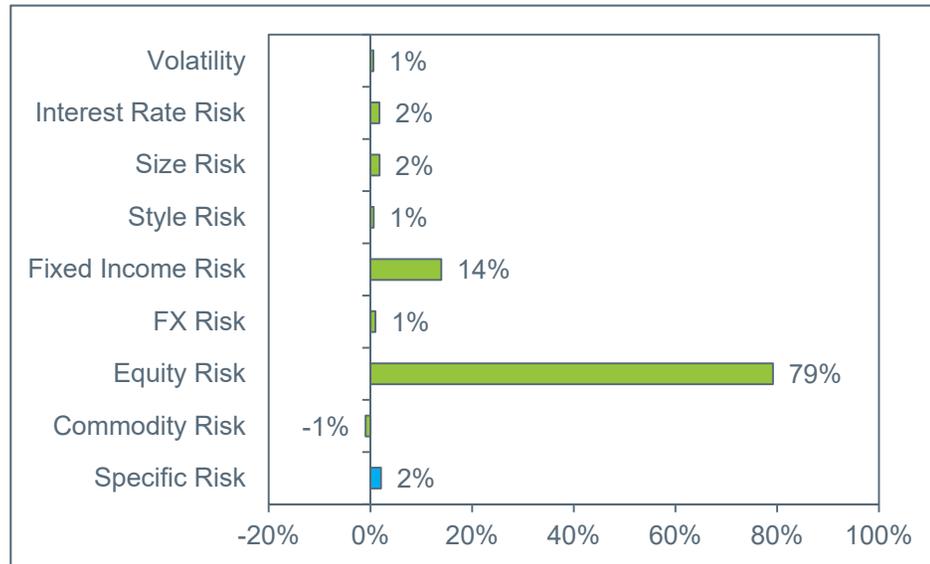
Volatility	4.1%
Value at Risk (VaR)*	7.5%
Expected Tail Loss (ETL)*	9.8%
Expected Tail Return (ETR)*	8.6%
Rachev Ratio (ETR/ETL)*	0.9
STARR Performance (Excess Return/ETL)**	0.1

\*Calculated with a 99% Confidence Interval.  
 \*\*Similar to the Sharpe Ratio which is a standard deviation-based performance measure, but STARR (stable tail-adjusted return ratio) uses the ETL in the denominator as a risk measure. STARR can be seen as a more effective indicator of risk-adjusted performance because it penalizes only for downside risk, while the standard deviation does not distinguish between upside and downside risk.

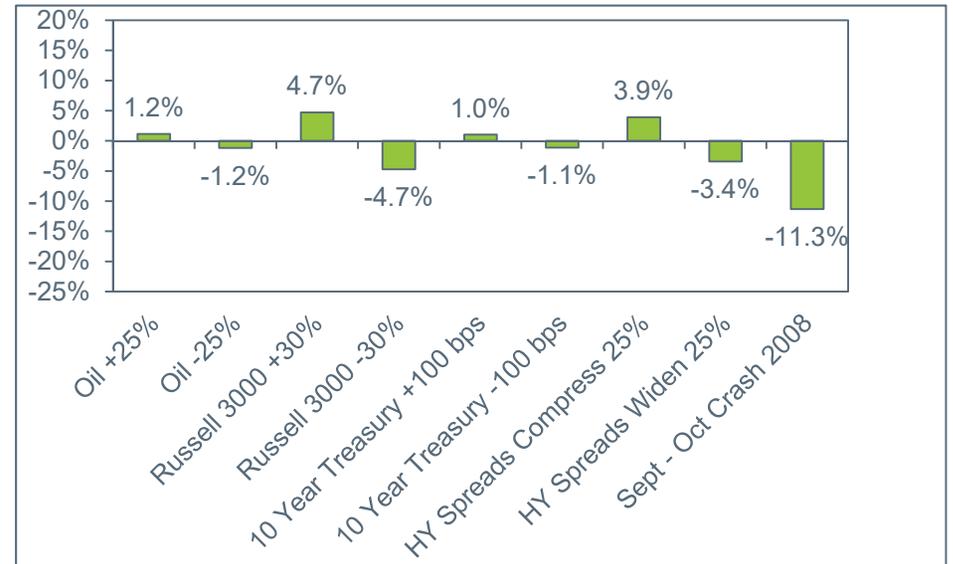
**Percent Contribution to Risk and ETL**



**Factor Contribution to Risk**



**Portfolio Historical Stress Tests**



Analysis provided by PerTrac RiskPlus powered by FinAnalytica. All values are annual.

# Stress Test Summary

Fund		Permanent Mineral Trust	Permanent Land Fund	University Permanent Land Fund	Hathaway Scholarship	Common School Permanent Land Fund	Higher Education	Workers Comp. Fund	Pool A	LSRA
<b>Fund Value as of 6/30/2019 (\$M)</b>		<b>\$7,972.0</b>	<b>\$194.7</b>	<b>\$26.2</b>	<b>\$591.9</b>	<b>\$4,078.5</b>	<b>\$120.3</b>	<b>\$2,234.3</b>	<b>\$243.3</b>	<b>\$1,554.8</b>
<b>Stress Test Returns (%)</b>	Oil +25%	1.9%	1.9%	1.9%	1.9%	1.6%	1.6%	0.9%	1.0%	1.2%
	Oil -25%	-1.8%	-1.8%	-1.8%	-1.8%	-1.5%	-1.5%	-0.7%	-1.0%	-1.2%
	Russell 3000 +30%	7.3%	7.3%	7.3%	7.3%	5.7%	5.7%	3.9%	4.2%	4.7%
	Russell 3000 -30%	-7.3%	-7.3%	-7.3%	-7.3%	-5.7%	-5.7%	-3.3%	-4.2%	-4.7%
	10 Year Treasury +100 bps	2.8%	2.8%	2.8%	2.8%	1.8%	1.8%	-2.4%	0.6%	1.0%
	10 Year Treasury -100 bps	-4.0%	-4.0%	-4.0%	-4.0%	-2.3%	-2.3%	6.9%	-0.2%	-1.1%
	HY Spreads Compress 25%	7.0%	7.0%	7.0%	7.0%	5.6%	5.6%	-1.2%	3.7%	3.9%
	HY Spreads Widen 25%	-6.5%	-6.5%	-6.5%	-6.5%	-4.9%	-4.9%	4.3%	-3.0%	-3.4%
	Sept - Oct Crash 2008	-17.2%	-17.2%	-17.2%	-17.2%	-15.6%	-15.6%	-13.4%	-12.3%	-11.3%
<b>Stress Test Returns (\$M)</b>	Oil +25%	\$154.3	\$3.8	\$0.5	\$11.5	\$64.5	\$1.9	\$19.4	\$2.5	\$18.0
	Oil -25%	-\$144.7	-\$3.5	-\$0.5	-\$10.7	-\$60.1	-\$1.8	-\$15.5	-\$2.5	-\$18.2
	Russell 3000 +30%	\$585.1	\$14.3	\$1.9	\$43.4	\$232.9	\$6.9	\$86.5	\$10.3	\$73.1
	Russell 3000 -30%	-\$578.8	-\$14.1	-\$1.9	-\$43.0	-\$231.7	-\$6.8	-\$74.0	-\$10.2	-\$73.2
	10 Year Treasury +100 bps	\$225.6	\$5.5	\$0.7	\$16.7	\$74.6	\$2.2	-\$54.5	\$1.4	\$16.2
	10 Year Treasury -100 bps	-\$316.5	-\$7.7	-\$1.0	-\$23.5	-\$95.4	-\$2.8	\$154.6	-\$0.6	-\$17.4
	HY Spreads Compress 25%	\$555.6	\$13.6	\$1.8	\$41.3	\$227.2	\$6.7	-\$27.3	\$8.9	\$61.1
	HY Spreads Widen 25%	-\$516.6	-\$12.6	-\$1.7	-\$38.4	-\$198.2	-\$5.8	\$97.0	-\$7.4	-\$53.3
	Sept - Oct Crash 2008	-\$1,372.2	-\$33.5	-\$4.5	-\$101.9	-\$634.5	-\$18.7	-\$298.7	-\$29.8	-\$175.9

PORTLAND

BOISE

CHICAGO

NEW YORK

